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SOURCE Voprosy Ekonomiki, No 2, 1949.MECHANIZATION OF LABOR-CONSUMING PROCESSES IN THE USSR

L. Berri and K. Klimenko

The experience of socialist construction in the USSR indicates that the level of qualification of workers increases with mechanization. In ferrous metallurgy, highly skilled and medium skilled workers made up 32 percent of all workers in 1931, and 56 percent in 1948. During that time the proportion of completely unskilled workers dropped from 48 to 10 percent.

In the automobile and tractor industry, development of mechanization and assembly-line methods of production has increased the number of highly skilled workers (7th and 8th classes) from 3 percent in 1931 to 10 percent in 1948. The proportion of unskilled workers (1st and 2d classes) has decreased from 49 to 18 percent.

In the timber industry, unskilled workers are replaced by skilled workers. Truck and tractor drivers replace carters; electric-saw operators, handsaw men; truck-crane operators, loaders, etc.

All branches of machine building are manufacturing machines which will insure the mechanization of labor-consuming processes. For example, the coal industry is receiving machinery from enterprises of the Ministry of Transport-Machine Building (coal combines, loading machines, etc.) and other ministries, in addition to that received from coal machine-building enterprises of the Ministry of Coal Industry. Both the Ministry of Construction and Road-Machine Building and the Ministry of Heavy Machine Building are producing heavy excavators. The Leningrad Plant imeni Kirov is manufacturing tractors to haul timber for the timber industry.

In 1948, the national economy exceeded 1947 production of heavy excavators, scrapers, bulldozers, dump cars, dump trucks, truck cranes and other machinery. Within the next few years it will be possible to eliminate manual labor in excavating work.

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The ferrous metallurgical industry, as a result of the nature of its basic equipment (blast and open-hearth furnaces, rolling mills), continuous operation machines, has the prerequisites for the establishment of a system of automatic operation of production. The servicing of these machines still requires many manual workers.

At present, metallurgy is the most highly mechanized Soviet industry. The USSR has built great new plants in which all basic production processes have been mechanized. The State has also modernized old plants in which many labor-consuming processes have been mechanized.

The fully mechanized blast-furnace plants are equipped with an automatic system for charging and stoking the furnace, and with casting machines, machines for plugging the tap hole, etc. Productivity of labor at large, fully mechanized blast furnaces is actually ten times greater than blast furnaces serviced by hand labor, and two times greater than at partly mechanized blast furnaces.

Production of open-hearth steel furnaces has also reached a high mechanized level. Most steel is produced in mechanized steel mills with ground-type charging machines, with an automatic system of tipping valves, automatic casting of steel in trolleys, etc. The productivity of labor in big mechanized open-hearth furnaces is five times greater than in nonmechanized ones. Rolling mills processes are also basically mechanized and partly in automatic operation.

Mechanization of labor-consuming processes has not been completed in a number of old ferrous metallurgical plants because of limitations in area and installations, or because of small-scale production. The level of mechanization and automatic operation in many new and modernized plants can also be substantially increased. For example, there is a pressing need for complete automatic operation of rolling mills.

Auxiliary services, especially loading and unloading, yard storage, transport and repair work, has not been fully mechanized in plants. About 5 - 7 tons of cargo, raw materials, fuel, finished and waste products, must be transported, loaded and unloaded to smelt one ton of pig iron. Great plants, producing over a million tons of steel a year, would require the transport, loading and unloading of millions of tons of cargo. Because of incomplete mechanization some factories utilize 30 percent of all their personnel in loading and unloading operations.

Complete mechanization can be rapidly achieved by the so-called "minor mechanization" of an even greater number of individual processes and by introduction of new and better plans for complete mechanization.

Mechanization of furnace stoking and charging with the burden and coke, of the servicing of furnace hearths, of casting machines, etc., will be completed on the basis of these plans. In open-hearth furnaces, the soles, furnace arches and casting shops, and their repair; and in rolling mills, the charging of coal in heating furnaces, opening the lids of these furnaces, delivery of metal and its charging in the mill, the servicing of old, nonmechanized rolling mills, and the delivery of the product are all being mechanized.

Estimates indicate that minor mechanization requires smaller investments (2000 - 3000 rubles for each worker made available as against 10,000 rubles or more in complete reconstruction) and can be quickly carried out. However, minor mechanization is generally only partial, i.e., it implies the maintenance of a large number of attending workers, employed on manual labor. Even though minor mechanization is carried out, primary attention must still be given to complete plant mechanization.

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Complete mechanization will vary with the type of plant: (1) for old plants; (2) for new plants, such as those of Magnitogorsk and Kuznetsk; and (3) for newly planned big plants where complete mechanization will be at an even higher level, taking advantage of all the newest achievements of science and technology, especially in automatic operation.

Even though many iron and steel mills have achieved complete mechanization and partial automatic operation, this is not enough. Further increases in the capacity and speed of the work of iron and steel mills can only be achieved by complete automatic operation. Complete automatic operation of the mills is not enough; the auxiliary services must be completely mechanized, if not put under automatic operation. Rolling of ingots is moving along at exceptional speeds. However, the actual rolling only requires from 20 - 60 percent of the time; auxiliary services (roller tables, tilters, coolers, etc.) account for the remaining time.

Complete automatic operation of Soviet metallurgical processes is now under way. For example, Mill No 3, Magnitogorsk Plant, achieved complete automatic operation in 1947. At this plant all auxiliary services have been placed under automatic operation and have been coordinated with production activities by a Central Administration of Automatic Operation. As a result, the role of the worker is limited to supervision of technological processes and to servicing and repair of breakdowns.

The complete automatic operation of rolling mills is a clear example of the new technology which must be carried out in all industries in the period of transition to Communism.

The logging industry has not been a heavy machine industry up to now and has actually lagged far behind other branches of industry in the degree of mechanization of labor-consuming processes.

In the first 3 years of the Five-Year Plan excellent results were obtained in the logging industry. Highly effective types of equipment were developed and manufactured on a large scale. The level of mechanization of timber felling by electric saws in the logging enterprises of the Ministry of Timber Industry of the USSR is now greater than in the US or Canada. The goals of the Five-Year Plan for hauling will be substantially exceeded.

Many types and models of electric saws, ranging from the heavy saws weight 20 - 30 kilograms, for operation by two men, to the light electric saw of 7.5 - 10 kilograms, designed for one lumberjack (Kharlamov and TSNIME-K-5 electric saws). Soviet electric saws facilitate the work of lumberjacks and increase their productivity 2 - 3 times. Electric saws superior in flexibility and performance to saws manufactured in the US, have been developed and will soon be in mass production. It will be possible to fulfill and exceed the Five-Year Plan's quota of 40,000 electric saws.

A great achievement of Soviet technology is the construction of a special trailer tractor which can operate over any terrain, and particularly over ground not cleared of stumps. The Kirov Factory in Leningrad constructed the world's first trailer tractor. Trailer tractors are now in mass production, and fulfillment of the quota set by the Five-Year Plan seems assured.

In addition to trailer tractors, portable winches and extremely simple Karelian-type truck cranes with a load-lifting capacity of one ton, have been introduced for skidding and loading. From a distance of 150 meters, these cranes can drag up to 70 cubic meters of whip. Light portable (Decauville) rails are also used for skidding.

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For loading timber on barges, trucks, narrow gauge, and trunkline railroads, electric winches, trucks, cranes, truck derricks, elevators, railroad loading cranes and other machines are being increasingly used. A backlog of experience in the use of these machines is being accumulated, and their mass-scale production is being developed in many plants.

Mechanization of loading work accelerates operations and increases the productivity of labor. For example, in certain timber managements, the average productivity of a worker using a truck crane was 21 cubic meters for the first quarter of 1948 as against 11 - 12 cubic meters by a worker using manual methods for a similar period. If, in addition, trucks are used for transporting timber, the output of a worker will rise to 60 - 70 cubic meters, or six times the output attained by manual loading.

The great increase in the available means of transport makes mechanized transport of timber possible. Appropriate forms of transport will be employed: narrow-gauge railroads in heavily wooded areas removed from trunk lines; trucks in lightly wooded areas; ice tractors in regions with long, persistent winters.

Electrification assumes an even greater role in the supply of power to the timber industry. In the first stage of electrification, 12- and 7-kilowatt mobile electric power plants are the primary sources of power. Use of the 7-kilowatt generator is to be curtailed. Central electric power plants with wood-burning steam engines will be set up in big timber producing areas serviced by narrow-gauge railroads. The network of inter-kolkhoz hydroelectric power plants and regional high-voltage electric transmission units are being increasingly utilized for power supply for logging.

The most important tasks in the mechanization of logging are: further improvement and better selectivity of the most effective machines; coordination of all machines to assure maximum continuous production; an increase in the level of mechanization and a minimum use of manual labor; an increase in the speed of work, a decrease in loss of time, and maximum utilization of machines.

The experiences of the Krasnoyarsk Mechanized Timber Center of the "Sovlesdrevmet" Trust in complete mechanization and continuous operations in logging are extremely valuable. In the first quarter of 1948, this center achieved an average daily output of 1.48 cubic meters per worker as against 0.77 cubic meters per worker for the trust as a whole. In the Yemsa Timber Transport Management of the "Sovtransles" Trust, a completely mechanized, continuous-operation brigade of 24 workers attained a level of production of 4 cubic meters per man in all work from felling to loading, as compared with the estimated norm of 2.8 cubic meters per man, i.e., the norm was exceeded by 40 percent.

Much still remains to be done in mechanization and in the increase of labor productivity. A brigade in the Yemsa Timber Transport Management consists of five sections (felling with electric saws, trimming, skidding, stacking, and work at the electric power plant). Only 40 percent of the work in the entire brigade is mechanized, and only 25 percent of the workers work with machinery. Preparation of clearing, cutting brushwood, delivery and unloading for stacking, and many other processes are still not mechanized. Despite progress in complete mechanization and continuous operation, the present level of mechanization is not high enough. Utilization of machines is unsatisfactory at many logging enterprises, and the value of machinery is not appreciated.

The construction industries are successfully fulfilling the tasks of the Five-Year Plan for mechanization of construction work. Many construction enterprises already exceeded the Plan's quota in 1948.

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In certain construction trusts, excavation work has only been slightly mechanized, in some cases only 10 - 25 percent. Plaster work is less than 5 percent mechanized in many trusts. Mechanization of excavating work, grading processes, and loading and unloading operations lag behind the level of mechanization of construction operations.

As Deputy I.S. Khokhlov pointed out at a session of the Supreme Soviet USSR, the task set by the government for mechanization of very important types of work of the Ministry of Construction of Heavy Industry Enterprises were not fulfilled. Many machines were improperly utilized. In particular, multibucket excavators were only 20 percent utilized as compared to the established norms; concrete mixers, only 71 percent; mortar mixers, only 80 percent; rock crushers, only 67 percent. These shortcomings, along with unsatisfactory organization of labor, have led to delays in putting many new plants into operation.

The lag in mechanization of certain construction organizations is not only caused by a lack of equipment, but also by an improper evaluation of the role of mechanization, by anti-mechanization attitudes, and by improper use of machinery. At the same time, the experiences of certain trusts (for example, "Soyuzskavatsiya" of the Ministry of Construction of Heavy Industry Enterprises, and mechanized columns of the Ministry of Transportation), and construction Stakhanovites prove that established norms can be exceeded.

The absence of complete mechanization of various types of work and of construction as a whole is a serious shortcoming. For example, in the mechanical preparation of cement in cement mixers, the introduction and proportioning of the sand, gravel and cement is sometimes done by hand. Only the process of stirring the mixture is mechanized. Although the Five-Year Plan provides for complete mechanization of various construction processes, only partial mechanization has actually been carried out.

Complete mechanization of construction processes facilitates labor and increases its productivity. In excavating work, complete mechanization provides excavators for digging out dirt, dump trucks for transport and unloading, bulldozers for leveling surface dirt, etc. With the replacement of horse-drawn excavators (in processing for clay) by even a small mechanical excavator and a truck, expenditure of manpower on one cubic meter of excavation work is reduced by six times. In turn a heavy tractor scraper driven by one worker can replace the excavator and six dump trucks, and can increase labor productivity by an additional ten times. A bulldozer does the work of 100 - 120 workers. A rock crusher frees 70 - 80 workers. A heavy excavator replaces 200 workers. Likewise, heavy work is replaced by lighter work, and the speed of work is increased.

Expenditures for mechanization of construction work are highly productive. For example, about 30 tons of metal, 5,000 machine-hours, and 10,000 man-hours go into the production of single-bucket excavators of 0.5 cubic meters lifting capacity. In two shifts these excavators replace 80 men. Consequently, the 10,000 man-hours expended in the manufacture of excavators are saved in 15 days of use. The full cost price of construction machinery is paid for by the saving of manual labor in, usually, no more than one or 2 years.

The introduction of continuous-operation methods is one of the real tasks facing the construction industry. First, construction of living quarters must be converted to the continuous-operation method of complete mechanization. By employing continuous operation methods in the construction of living quarters, "Karakandakhilstroy" was able to release 40 percent of the workers in its wood-working combines. The output of construction workers who employ continuous-operation methods exceeds the usual productivity of labor by 2 - 2.5 times.

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